

# **Support Documents**

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

OSWER 9200.2-111

SEP 13 2012

**MEMORANDUM**

**SUBJECT:** Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews

**FROM:** James E. Woolford, Director   
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**TO:** National Superfund Program Managers, Region 1-10

**PURPOSE**

The purpose of this memorandum is to clarify the use of protectiveness determinations in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Reviews (FYR). It provides general guidance for the use of specific protectiveness determinations and recommends language to be used when drafting a protectiveness statement. The information provided in this memorandum supplements, but does not supersede, the language in the "Comprehensive Five-Year Review Guidance," OSWER No. 9355.7-03B-P (June 2001).

**BACKGROUND**

An audit by the Office of Inspector General (OIG) entitled "*Stronger Management Controls Will Improve EPA Five-Year Reviews of Superfund Sites*" issued February 6, 2012 identified situations where data provided in a FYR report did not fully support the region's protectiveness determination. Specifically, the OIG identified situations where the regions did not follow agency guidance for making protectiveness determinations for remedies under construction and concluded that short-term protectiveness was not adequately defined in Agency guidance. As a result, the OIG recommended that the Office of Solid Waste and Emergency Response (OSWER) clearly define the protectiveness categories used in Agency guidance and ensure that protectiveness definitions are consistently applied across the Agency.

The purpose of a FYR is to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment. Protectiveness is generally defined in the National Contingency Plan (NCP) by the risk range for carcinogens and the hazard index (HI) for non-cancer effects. Evaluation of the remedy and the determination of protectiveness should be based on and sufficiently supported by data and observations. Consistent with the "*Comprehensive Five-Year Review Guidance*," a discussion of this evaluation should be described and presented in the FYR report, along with the protectiveness determination.

## IMPLEMENTATION

To assess the protectiveness of the remedy, it is important to evaluate human health risks, ecological risks, and the general performance of the selected remedy. To facilitate this evaluation, a technical assessment of a remedy is conducted to answer the following questions. The answers to these questions provide a framework for organizing and evaluating the FYR data and information:

Question A –Is the remedy functioning as intended by the decision documents?

Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

### Evaluating Remedy Protectiveness

For CERCLA sites that require a FYR, a separate protectiveness statement is required for each operable unit (OU) where the remedial action is currently underway or remedial construction is complete. If the site is construction complete, a site-wide protectiveness determination is also required and will generally be the same protectiveness determination as the least protective OU at the site.

The OSWER "*Comprehensive Five-Year Review Guidance*" defines five protectiveness categories: protective, short-term protective, will be protective, protectiveness deferred, and not protective. The following discussion provides general guidance for the use of the specific protectiveness determinations and recommends language to be used when drafting the protectiveness statement for the FYR report.

### Protective

A protectiveness determination of "protective" may be appropriate for remedies where:

- Construction activities are complete and remedy is operating; or
- Construction activities are complete, remedial action objectives (RAOs) have been achieved, and operation and maintenance activities are occurring.

A protectiveness determination of "protective" is typically used when the answers to Questions A, B and C provide sufficient data and documentation to conclude that the remedy is functioning as intended and all human and ecological risks are currently under control and are anticipated to be under control in the

future.

#### Recommended Language for a Protectiveness Determination of "Protective"

*"The remedy at OUX is protective of human health and the environment."*

The Remedial Project Manager should briefly describe in a separate paragraph below the protectiveness statement the elements of the remedy that protect human health and the environment and how the RAOs have been met or are being met.

#### Short-Term Protective

A protectiveness determination of "short-term protective" may be appropriate for remedies where:

- Construction activities are complete and remedy is operating; or
- Construction activities are complete, remedial action objectives have been achieved, and operation and maintenance activities are occurring.

A protective determination of "short-term protective" is typically used when the answers to Questions A, B and C provide sufficient data and documentation to conclude that the human and ecological exposures are currently under control and no unacceptable risks are occurring. However, the data and/or documentation review also raise issues that could impact future protectiveness or remedy performance but not current protectiveness. Examples of scenarios that may result in a short-term protectiveness determination may include:

- No exposure is occurring but institutional controls have not been fully implemented;
- Future land use assumptions may have changed;
- Engineering performance issues related to the operation of the remedy; or
- Monitoring data indicates that remedy will not achieve goals in the anticipated time frame

#### Recommended Language for a Protectiveness Determination of "Short-Term Protective"

*"The remedy at OUX currently protects human health and the environment because (describe the elements of the remedy that protect human health and the environment in the short-term). However, in order for the remedy to be protective in the long-term, the following actions need to be taken (describe the actions needed) to ensure protectiveness."*

#### Will be Protective

A protectiveness determination of "will be protective" may be appropriate for remedies where:

- Construction activities are ongoing

A protective determination of "will be protective" is typically used when the answers to Questions A, B and C provide sufficient data and documentation to conclude that the human and ecological exposures are currently under control and no unacceptable risks are occurring in those areas. In addition, answers

to Questions A, B and C also indicate that the remedy under construction is anticipated to be protective upon completion and no remedy implementation or performance issues have been identified.

#### Recommended Language for a Protectiveness Determination of “Will Be Protective”

*“The remedy at OUX is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.”*

#### Protectiveness Deferred

A protectiveness determination of “protectiveness deferred” may be appropriate for remedies where:

- Construction activities are ongoing;
- Construction activities are complete and remedy is operating; or
- Construction activities are complete, remedial action objectives have been achieved, and operation and maintenance activities are occurring.

This protective determination is generally used when the available information to answer Questions A, B and C does not provide sufficient data and documentation to conclude that all human and ecological risks are currently under control and no unacceptable exposures are occurring. Examples of scenarios that may result in a “protectiveness deferred” determination include:

- A new exposure pathway (e.g., vapor intrusion) has been identified and additional data are required to determine if an unacceptable risk is occurring;
- An emerging contaminant is present and the current risk has not been evaluated;
- An ecological risk assessment has never been adequately addressed at the site; or
- The toxicity value has changed and it unclear whether the current remedy at a site is protective or whether the selected remedy can achieve the new risk-based cleanup level.

When a protectiveness deferred determination is made, the protectiveness statement generally discusses the actions needed to collect the missing information and the timeframe anticipated to complete these actions. Once the necessary data and/or information are obtained, a Five-Year Review addendum is typically completed that documents the protectiveness determination for the OU(s) where the protectiveness had been deferred.

#### Recommended Language for a Protectiveness Determination of “Protectiveness Deferred”

*“A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions (describe the actions). It is expected that these actions will take approximately (insert time frame) to complete, at which time a protectiveness determination will be made.”*

#### Not Protective

A protectiveness determination of “not protective” may be appropriate for remedies where:

- Construction activities are ongoing;
- Construction activities are complete and remedy is operating; or
- Construction activities are complete, remedial action objectives have been achieved, and operation and maintenance activities are occurring.

A protectiveness determination of “not protective” is generally used when the answers to Questions A, B and C provide adequate data and documentation to conclude that the human and/or ecological risks are not currently under control. Examples of scenarios that may result in a “not protective” determination include:

- An immediate threat is present (ex. new exposure pathway identified and it is reasonably likely to assume that unacceptable exposures are occurring)
- Migration of contaminants is uncontrolled and poses an unacceptable risk to human health and the environment; or
- Potential or actual exposure is clearly present or there is evidence of exposure

#### Recommended Language for a Protectiveness Determination of “Not Protective”

*“The remedy at OU X is not protective because of the following issues(s) (describe each issue). The following actions need to be taken (describe the actions needed) to ensure protectiveness.”*

## **CONCLUSION**

A five-year review should determine whether the remedy at a site is or upon completion will be protective of human health and the environment. The level of effort necessary to conduct a five-year review is site-specific and should be tailored appropriately for the remedial action and its stage of implementation.

If you have any questions, please contact David Cooper at (703) 603-8763 or at [cooper.davide@epa.gov](mailto:cooper.davide@epa.gov).

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## **Executive Summary Sample**

This Executive Summary has been modified from the original for training purposes.

### **Introduction**

The Sharpe Army Depot Superfund site (the Site) is located in California's primarily agricultural San Joaquin County, within the limits of the City of Lathrop. The 724-acre site is a Defense Logistics Agency (DLA) facility that has been involved in the storage, shipping, packaging, and maintenance of general supplies for the Department of Defense (DOD). Wastes generated at the Site were primarily a result of former maintenance operations such as paint stripping, metal finishing, and painting. Other waste-generating activities included engine overhauls, hydraulic and electrical repairs, airframe and bodywork, and component repair and reconditioning. These tasks required the use of petroleum hydrocarbon fuels and a variety of other industrial chemicals (e.g., chlorinated solvents). Releases of these chemicals contaminated installation soil and ground water with volatile organic compounds (VOCs), metals, total petroleum hydrocarbons (TPH), and pesticides.

The EPA placed the Site on the National Priorities List (NPL) in 1987. In 1989, the Army, the EPA, Central Valley Regional Water Quality Control Board (CVWB) and California Department of Toxic Substances Control (DTSC) co-signed the Federal Facility Agreement (FFA) for the Site. The FFA established two operable units (OUs) to facilitate environmental cleanup at the Site. Both OUs are being evaluated in this Five-Year Review (FYR). OU 1 encompasses ground water in four (A, B, C, and D) monitoring zones contaminated primarily with VOCs released from activities on the installation. OU 2 consists of contaminated soil and soil vapor above the water table.

This is the Third FYR Report for remedial actions performed at the Site. The triggering action for this FYR was the signing of the previous FYR report on September 24, 2009. This review evaluates the performance of remedial actions performed at the Site, as well as actions taken in response to recommendations made in the second FYR, to determine whether the remedial actions are protective of human health and the environment. The executive summary will focus on the remedies that had issues of protectiveness, but will also mention the remedies that were found to be protective.

### **Protectiveness Determinations**

The purpose of a FYR is to evaluate the implementation and performance of the remedy in order to determine if the remedy is or will be protective of human health and the environment. Each OU was reviewed according to the 2001 EPA Comprehensive FYR Guidance which lays out a process that includes community involvement, document and data review, site inspections, interviews, and a technical assessment of the protectiveness of a remedy. Three questions examined during the technical assessment of a remedy are:

- A. Is the remedy functioning as intended by the decisions documents?
- B. Are the assumptions used at the time of remedy selection valid?
- C. Has any other information come to light that could call into question the protectiveness of the remedy?

The outcome of each review is a statement of protectiveness and a list of issues, recommendations, and follow-up actions for each OU.

### **Operable Units with Issues**

OU1 and OU2 were both found to be protective in the short term. Table 1 includes OUs, contaminants, RAOs, Selected Remedy, and Remedy Status.

**Table 1: OU Remedial Action Summaries and Protectiveness Status**

| <b>Operable Units Evaluated in this Review</b> |                    |                           |   |  |                                 |
|--|--------------------|---------------------------|---|--|---------------------------------|
| <b>Areas Protective in the Short Term</b>      |                    |                           |   |  |                                 |
| <b>EPA Name</b>                                | <b>Description</b> | <b>Contaminant Types</b>  | <b>Remedial Action Objectives</b>   | <b>Remedy</b>  | <b>Remedy Status</b>            |
| OU1  | Ground Water       | VOCs                      | Mitigate potential long-term contaminant migration and protect exposure to contaminated ground water  | Ground water extraction, Air stripping                 | Complete<br>In place, effective |
| OU2  | Soil               | Trichloroethene<br>Metals | <ul style="list-style-type: none"> <li>• Prevent further degradation of ground water</li> <li>• Source control: reduce the mass of TCE available to ground water</li> <li>• Source control: eliminate on-site worker exposure to lead and chromium in soils.</li> </ul> | Soil removal, Soil Vapor Extraction, Land Use Controls | Complete<br>In place, effective |

### **Issues of Concern and Next Steps**

Each issue should be linked to the area in the report where it is discussed in greater detail.

The following issues and recommendations that may affect the protectiveness of the OU1 and OU2 remedies will be tracked by EPA in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) FYR module. The Army is the implementing party for all recommendations, with EPA and State oversight.

**Table 2: Issue and Recommendation Summary**

| Operable<br>Unit<br>Site<br>Description | Issue<br>Type | Issue  | Recommendation  | Affects Protectiveness |        | Milestone<br>Date |
|---|---------------|--|---|------------------------|--------|-------------------|
|   |               |  |   | Current                | Future |                   |
| OU1<br>Ground<br>Water                  | RP            | Plume Migration to Off-Depot Potable Well PW020. Increased TCE concentrations at off-depot potable well PW020 (industrial-use well)  | Work with the water supplier to determine an appropriate response.  | N                      | Y      | March 13, 2014    |
|   | IC            | Future groundwater users are not protected from Site VOC plumes.   | Finalize the draft OU 1 ESD (URS, 2012a) that adds LUCs to the OU 1 remedy.   | N                      | Y      | Sept 30, 2013     |
|   | RP            | Public well PW038 may be a conduit for migration of COC contamination to clean groundwater because PW038 it has screen intervals above and below the confining clay layer.   | Decommission (destroy) PW038 to eliminate it as a potential conduit for migration of the North Balloon TCE plume to below the confining clay.                                     | N                      | Y      | Dec 31, 2015      |
|   | CH            | Ground water sampling indicates a potential 2 <sup>nd</sup> source of PCE/TCE/CCl <sub>4</sub> in the South Balloon area. A field sampling effort to collect and analyze soil vapor and shallow groundwater samples in the MW326 area has been proposed. | Evaluate the potential for a secondary source of VOCs in the western portion of the South Balloon plume.  | N                      | Y      | June 20, 2014     |
|   | RP            | <b>Discharge Capacity.</b> Treated groundwater discharge capacity is limited.  | Locate new discharge areas on site for treated groundwater to provide additional capacity for optimized groundwater extraction if wells are restarted or new wells are installed. | N                      | Y      | Dec 31, 2014      |
| OU2<br>Soil &<br>Soil Vapor             | CH            | <b>Sites P-1A, P-1B, and P-1C.</b> A residual TCE mass may be present in the vadose zone at Sites P-1A, P-1B, and P-1C. This may pose a threat to groundwater quality.   | Conduct additional soil vapor sampling at Sites P-1A, P-1B and P-1C to delineate the extent of TCE concentrations in the vadose zone greater than the OU 2 ROD cleanup level.     | N                      | Y      | Dec 31, 2015      |
|   | CH            | <b>Site S-33/29.</b> Radiological detections at Site S-33/29 have not been fully characterized.  | Complete investigation of the area of potential radiological concern at Site S-33/29.   | N                      | Y      | Dec 31, 2015      |

Issue types

RP = remedy performance

IC = institutional or land use controls

CH = changed site conditions

### Protective Operable Units

If applicable, add links to corresponding section in FYR and explain that more information about areas that were found to be protective can be found in the main report. There are no OUs in this review that are Protective in the long term throughout the entire OU. The following sub-areas of OU-2 require no further remedial action, and are suitable for unlimited use and unrestricted access: (list).

### Protectiveness Statements

The remedy for OU 1 currently protects human health and the environment because the extraction and treatment system is containing most of the plume, no groundwater users are being exposed to COC concentrations that pose unacceptable risks, and the vapor intrusion pathway from groundwater is not complete. For the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: implement appropriate and feasible response actions to ensure protection of human health for the users of PW020 groundwater or groundwater from other potable wells that may become impacted by Site VOC plumes; establish LUCs in the OU 1 ESD; decommission PW038; and identify additional potential discharge locations for treated groundwater.

The remedy at OU2 is currently protective of human health and the environment because fences and LUCs are in place and functioning to eliminate on-site worker exposure to lead and chromium in soils, and SVE is reducing the mass of TCE above the ground water in most source areas. To be protective in the long term, an additional TCE source at sites P-1A, P-1B, and P-1C should be delineated and assessed for remedy, and further radiological characterization of Site S-33/29 should take place.

Sitewide protectiveness statement: Because the remedial actions at OU 1, OU 2 TCE Sites P-1A, P-1B, and P-1C, and OU 2 metals Site S-33/29 are protective in the short term, the Site is protective of human health and the environment in the short term. Actions that need to be taken to ensure protectiveness are described above in the individual protectiveness statements. (Optional to add: The remedial actions at OU 2 TCE Sites P-1D, P-1E, P-1F, P-1G, P-2A, P-2B, P-3A, P-4A, P-4B, P-4C, P-5A, P-6A, and P-8A and OU 2 metals Sites S-3, S-26, S-30, and S-36 are protective of human health and the environment.)

## Five-Year Review Summary Form

| SITE IDENTIFICATION   |  |  |
|---|--|--|
| <b>Site Name:</b> Sharpe Army Depot   |  |  |
| <b>EPA ID:</b> CA8210020832   |  |  |
| <b>Region:</b> 9  | <b>State:</b> CA   | <b>City/County:</b> San Joaquin County |
| SITE STATUS   |  |  |
| <b>NPL Status:</b> Final  |  |  |
| <b>Multiple OUs?</b><br>Yes   | <b>Has the site achieved construction completion?</b><br>Yes |  |
| REVIEW STATUS   |  |  |
| <b>Lead agency:</b> Other Federal Agency<br>If "Other Federal Agency" was selected above, enter Agency name: Defense Logistics Agency |  |  |
| <b>Author name (Federal or State Project Manager):</b> Maurice Benson   |  |  |
| <b>Author affiliation:</b> DLA Installation Support at San Joaquin  |  |  |
| <b>Review period:</b> 2012-2013   |  |  |
| <b>Date of site inspection:</b> 24 January 2013   |  |  |
| <b>Type of review:</b> Statutory  |  |  |
| <b>Review number:</b> 3   |  |  |
| <b>Triggering action date:</b> 24 September 2009  |  |  |
| <b>Due date (<i>five years after triggering action date</i>):</b> 24 September 2014   |  |  |

## Defense Depot Memphis Third Five-Year Review Fact Sheet



### What is a Five-year Review?

The purpose of a five-year review is to determine if remedies at a site are/remain protective of human health and the environment. If any issues that affect current and future protectiveness are found during the five-year review, recommendations are made to address them. The report addresses three major questions:

- Is the remedy functioning as intended?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?
- Has any other information surfaced that could affect the protectiveness of the remedy?

### Site Chronology

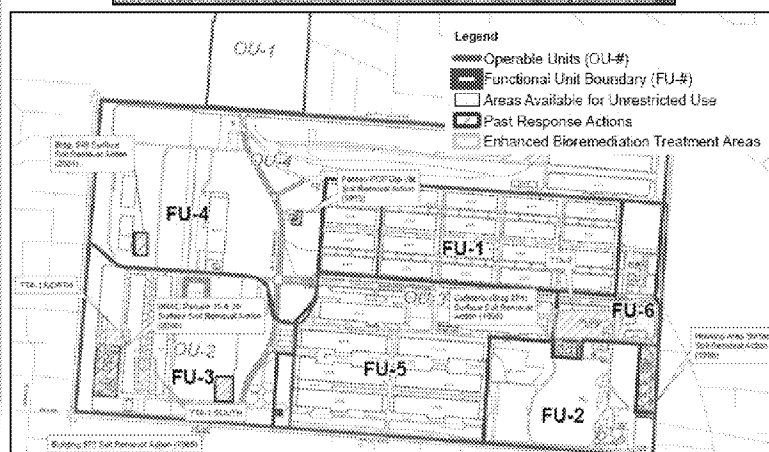
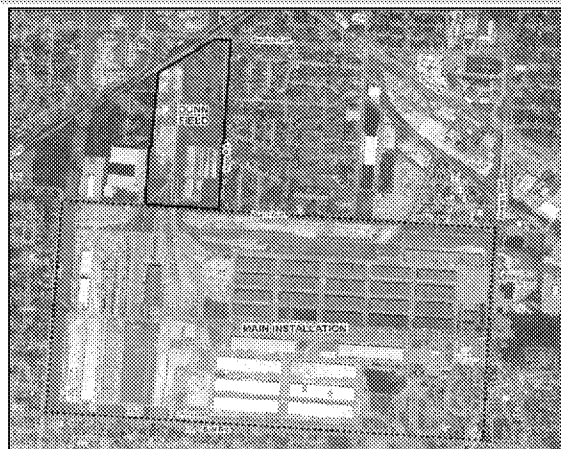
- **1981 – Initial Assessment Study:** Identified site hazards at exposure routes.
- **1992 – National Priorities List (NPL) Listing:** Site placed on NPL and identified as needing a long-term cleanup plan.
- **1997 – Facility Closed:** Depot received closure permits for its air, underground storage tank, stormwater discharge, and Nuclear Regulator facilities.
- **1998 – Initiation of Interim Remedial Action:** Groundwater recovery system installed at Dunn Field, this action was the trigger for the first five-year review.
- **2003 – First Five-Year Review**
- **2008 – Second Five-Year Review**
- **2012 – Sitewide Construction Complete:** Construction of remedies completed and NPL status updated to Construction Complete.

### Site History

The Depot is located in Memphis, Tennessee approximately 5 miles east of the Mississippi River and just northeast of Interstate 240. The property is approximately 632 acres and includes two components: Dunn Field and the Main Installation (MI). The site is located in an area of mixed residential, commercial and industrial land use.

The Depot served as a hub for the distribution of a variety of materials to the U.S. military from 1942 until the facility was closed in 1997. Hazardous substances were also stored and disposed of on site, resulting in soil and groundwater contamination by potentially hazardous wastes, including metals, hydrocarbons, and chlorinated volatile organic compounds.

### Site Map



## Major Developments since Last Five-Year Review

- **Operable Unit (OU) 1/Dunn Field:** Thermal soil vapor extraction was completed in December 2008 and removed 12,500 pounds of volatile organic compounds (VOCs). From July 2007-April 2012 fluvial soil vapor extraction removed 4,045 pounds of VOCs and was shutdown in July 2012. Soil samples met the remedy goals for both systems. From November 2009-June 2012 air sparge/soil vapor extraction removed 77 pounds of VOCs. Long term monitoring of 87 wells is being conducted on a semiannual basis.
- **OUs 2-4/Main Installation:** Long-term monitoring of 112 wells is being conducted on a semiannual basis and additional wells have been installed in the fluvial, intermediate and Memphis aquifers.
- **Sitewide:** Physical construction of all soil and groundwater extraction systems was completed in May 2010 and NPL site status was revised to Construction Complete.

## Issues, Follow-up Actions, and Schedule Dates

These issues do not affect current protectiveness because there is no current exposure to chemicals of concern in groundwater. They don't affect future protectiveness because the remedies have been effective in controlling groundwater contaminants.

- **Groundwater contaminants at OU 1/Dunn Field:** There is potential for rebound in groundwater concentrations of chlorinated volatile organics (CVOs) at OU 1/Dunn Field following shut down of the fluvial soil vapor extraction system in July 2012. The air sparge/soil vapor extraction system will operate through December 2014 and long-term monitoring will continue through 2020.
- **Groundwater contaminants at OUs 2-4:** There was a rebound in groundwater CVOC concentrations above the level considered safe for consumption at the intermediate aquifer. Water from this aquifer is not used as a source of drinking water, but migration could impact the primary drinking water source for the City of Memphis. Department of the Army will restart enhanced bioremediation treatment in November 2012 and long-term monitoring will continue through 2016.

## Protectiveness Summary

OUs 1-4

• **Protective**

Sitewide

• **Protective**

Next Five -  
Year Review

• **January 2018**

## Contact Information

All publicly available documentation including the complete five year review is located at:

<http://www.epa.gov/region4/superfund/site/fedfacs/memdedpttn.html>



# Rocky Flats Environmental Technology Site

## OU Summary

| OU/<br>Common<br>Name | ROD date  | Description   | RAOs  | Remedy   |
|-----------------------|---|---|---|--|
| OU 1<br>Central OU    | CAD/ROD<br>Sept 2006<br><br>CAD/ROD<br>Amendment<br>Sept 2011 | Includes<br>1. 800+ mostly removed structures<br>2. Waste disposal pits<br>3. Solar evaporation ponds, removed<br>4. 2 LF's<br>5. Drainages<br>6. Ponds<br>7. Ditches<br><br>COC's<br>1. Radionuclides<br>2. Organic solvents/VOC's<br>3. Metals<br>4. Nitrates<br><br>Contamination of air, soil, sediment, GW & SW. | Ground Water<br>1. Meet groundwater quality standards, which are the Colorado Water Quality Control Commission surface water standards, at groundwater AOC wells.<br>2. Restore contaminated groundwater that discharges directly to surface water as base flow, and that is a significant source of surface water, to its beneficial use of surface water protection wherever practicable in a reasonable timeframe. This is measured at groundwater Sentinel wells. Prevent significant risk of adverse ecological effects.<br>3. Prevent domestic and irrigation use of groundwater contaminated at levels above MCLs. | ROD incorporated completed remedies at LFs, soil & building removal, pond dredging, and for water treatment.<br><br>Monitoring & maintenance of LF's and GW systems.<br><br>ERA supplement Environmental monitoring.<br><br>ICs<br>1. Residential and Commercial building construction prohibited<br>2. Soil disturbance below 3 ft. prohibited w/o regulatory review.<br>3. Surface soil disturbance prohibited w/o regulatory review.<br>4. Drinking/agricultural SW use prohibited.<br>5. GW well drilling prohibited.<br>6. Landfill cover disturbance prohibited<br>7. Any activities that interfere with remedy actions are prohibited except when in accordance w/ RFLMA. |
|                       |   |   | Surface Water<br>1. Meet surface water quality standards, which are the Colorado Water Quality Control Commission surface water standards.  |  |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  | <p>Soil</p> <ol style="list-style-type: none"> <li>1. Prevent migration of contaminants to groundwater that would result in exceedances of groundwater RAOs.</li> <li>2. Prevent migration of contaminants that would result in exceedances of the surface water.</li> <li>3. Prevent exposures that result in an unacceptable risk to the WRW. The 10-6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at the site or multiple pathways of exposure (40 Code of Federal Regulations 300.430[e][2][i][A][2]). Prevent significant risk of adverse ecological effects.</li> </ol> | <p>Physical Controls</p> <ol style="list-style-type: none"> <li>1. Perimeter signage.</li> <li>2. Ongoing protection of prior remedy actions.</li> </ol> |
|  |  |  | Land use consistent with a wildlife refuge   |  |

| OUs which were not evaluated in 2006 5YR |                                |                   |                                     |
|--|--------------------------------|-------------------|-------------------------------------|
| OU                                       | Common Name                    | Why not evaluated | Notes                               |
| OU 2 & OU 3                              | Peripheral OU<br>Offsite Areas | UU/UE             | No contaminants above UU/UE levels. |

UU/UE = suitable for unlimited use/unrestricted exposure; protectiveness evaluation not required. Advisable to check changes to toxicity factors to see if new

COPCs are present

5YR = Five Year Review

AOC = Areas of concern

COCs = contaminants of concern

ERA = Ecological risk assessment

GW = Ground water

IC = Institutional controls

LF = Landfill

MCL = Maximum contaminant level

OU = operable unit

POC = Point of compliance

RAOs = remedial action objectives

RFLMA = Rocky Flats Legacy Management Agreement

ROD = Record of Decision

SW = Surface water

WQ = Water quality

WRW – Wildlife refuge worker

Other acronyms as they are defined in the Five Year Review

# Rocky Flats Environmental Technology Site

## OU Summary

| OU/<br>Common<br>Name | RAOs   | Remedy   | Technical Evaluation Support   |
|-----------------------|--|--|--|
| Central OU            | Ground Water (GW to SW)  |  |  |
|                       | 1. Meet groundwater quality standards, which are the Colorado Water Quality Control Commission surface water standards, at groundwater AOC wells.  | <ul style="list-style-type: none"><li>Monitoring &amp; maintenance of GW systems.</li><li>Treatment of contaminated water before release to SW</li></ul><br>ICs <ul style="list-style-type: none"><li>Drinking/agricultural SW use prohibited.</li><li>GW well drilling prohibited.</li><li>Any activities that interfere with remedy actions prohibited except when in accordance w/ RFLMA.</li></ul> | <ul style="list-style-type: none"><li>Graphs of AOC well concentrations from annual reports.</li><li>Map locating AOC wells.</li><li>Text regarding compliance w/ RAO.</li></ul>   |
|                       | 2. Restore contaminated groundwater that discharges directly to surface water as base flow, and that is a significant source of surface water, to its beneficial use of surface water protection wherever practicable in a reasonable timeframe. This is measured at groundwater Sentinel wells. Prevent significant risk of adverse ecological effects. |  | <ul style="list-style-type: none"><li>Graphs of representative Sentinel well concentrations.</li><li>Graph of treatment system's concentration at discharge points.</li><li>Map locating Sentinel wells and outfall(s) / discharge points (treatment systems).</li><li>Text regarding compliance w/ RAO.</li></ul> |
|                       | 3. Prevent domestic and irrigation use of groundwater contaminated at levels above MCLs.   |  | <ul style="list-style-type: none"><li>Map showing known contamination and showing the IC boundary is appropriate.</li><li>Text discussing effectiveness of IC.</li></ul>   |
|                       | Surface Water  |  |  |
|                       | 1. Meet surface water quality standards, which are the Colorado Water Quality Control Commission surface water standards.  | <ul style="list-style-type: none"><li>ERA supplement Environmental monitoring.</li><li>Monitoring at POCs</li></ul>  | <ul style="list-style-type: none"><li>Graphs of contaminants at POCs.</li><li>Text describing compliance w/ RAO's, excursions, and corrective actions taken for excursions.</li></ul>  |

|  |   |   |  |
|--|---|---|--|
|  | Soil  |   |  |
|  | 1. Prevent migration of contaminants to groundwater that would result in exceedances of groundwater RAOs.   | <ul style="list-style-type: none"> <li>• Monitor at Sentinel wells</li> <li>• Treat significant detections at WTP before release to SW</li> </ul>   | <ul style="list-style-type: none"> <li>• GW discharge to SW support as above.</li> <li>• Text reporting on effectiveness of landfill repair &amp; maintenance program.</li> </ul>  |
|  | 2. Prevent migration of contaminants that would result in exceedances of the surface water.   | <ul style="list-style-type: none"> <li>• Prevent GW to SW migration as above</li> <li>• Repair and maintain landfill and soil covers, maintain vegetation</li> <li>• Ongoing protection of remedy components</li> </ul>   | <ul style="list-style-type: none"> <li>• Text reporting on protection of remedy components (wells, treatment systems, landfill covers, soil caps, the vegetation cover).</li> </ul>  |
|  | 3. (Part 1) Prevent exposures that result in an unacceptable risk to the WRW. The 10-6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at the site or multiple pathways of exposure (40 Code of Federal Regulations 300.430[e][2][i][A][2]). | <ul style="list-style-type: none"> <li>• Repair and maintain landfill and soil covers, maintain vegetation</li> <li>• Ongoing protection of remedy components</li> <li>• LUCs/ICs: <ul style="list-style-type: none"> <li>○ Perimeter signage</li> <li>○ Activity restrictions</li> <li>○ GW use restrictions</li> <li>○ Digging restrictions</li> <li>○ Construction restrictions</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Text reporting on effectiveness of repair &amp; maintenance program.</li> <li>• Text reporting on protection of remedy components (wells, treatment systems, landfill covers, soil caps, the vegetation cover).</li> <li>• Text reporting on effectiveness of signage &amp; ICs.</li> </ul> |
|  | 3. (Part 2) Prevent significant risk of adverse ecological effects.   | <ul style="list-style-type: none"> <li>• Repair and maintain landfill and soil covers, maintain vegetation</li> <li>• Ongoing protection of remedy components</li> <li>• ERA supplement Environmental monitoring.</li> </ul>  | <ul style="list-style-type: none"> <li>• Text reporting on effectiveness of repair &amp; maintenance program.</li> <li>• Text reporting on protection of remedy components (wells, treatment systems, landfill covers, soil caps, the vegetation cover).</li> </ul>  |
| Land use consistent with a wildlife refuge |   |   | Text   |

#### COPC's

- Radionuclides
- Organic solvents/VOC's
- Metals
- Nitrates

| OUs not evaluated in 2006 5YR |               |                   |  |
|-------------------------------|---------------|-------------------|--|
| OU                            | Common Name   | Why not evaluated | Notes  |
| Peripheral OU                 | Peripheral OU | UU/UE             | Confirm toxicity factor and standard changes haven't affected assumptions regarding UU/UE. |

UU/UE = suitable for unlimited use/unrestricted exposure; protectiveness evaluation not required. Advisable to check changes to toxicity factors to see if new COPCs are present

5YR = Five Year Review

AOC = Areas of concern

COPCs = contaminants of potential concern

ERA = Ecological risk assessment

GW = Ground water

IC = Institutional controls

LF = Landfill

MCL = Maximum contaminate level

OU = operable unit

POC = Point of compliance

RAOs = remedial action objectives

RFLMA = Rocky Flats Legacy Management Agreement

ROD = Record of Decision

SW = Surface water

WQ = Water quality

WRW – Wildlife refuge worker

WTP = Water treatment plant

Other acronyms as they are defined in the Five Year Review

| REG | ST | EPA ID       | SITE NAME                    | NPL | FF | SITE-<br>WIDE<br>OU | ACTION | FYR<br>TYPE | FYR DUE<br>DATE | FYR FINISH<br>(ACTUALS) | FYR<br>FUTURE<br>REVIEW<br>NEEDED? | CC DATE   | DELETION<br>DATE | PRIMARY RPM  |
|-----|----|--------------|------------------------------|-----|----|---------------------|--------|-------------|-----------------|-------------------------|------------------------------------|-----------|------------------|--------------|
| 08  | CO | CO7890010526 | ROCKY FLATS PLANT<br>(USDOE) | F   | Y  | 00                  | VY3    | S           | 7/30/2012       | 7/30/2012               | Y                                  | 9/29/2006 |                  | Moritz, Vera |

| OU INCLUDED IN FYR |               | OU NOT INCLUDED IN FYR |                                      | IS THERE AN RA ACTUAL START<br>AT OU NOT INCLUDED? |
|--------------------|---------------|------------------------|--------------------------------------|--|
| 01                 | CENTRAL OU    | 04                     | SOLAR PONDS                          | N  |
| 02                 | PERIPHERAL    | 05                     | WOMAN CREEK/ORIGINAL<br>LF           | N  |
| 03                 | OFFSITE AREAS | 06                     | WALNUT CREEK                         | N  |
|                    |               | 07                     | PRESENT LANDFILL                     | N  |
|                    |               | 08                     | 700 AREA                             | N  |
|                    |               | 09                     | ORIGINAL PROC. WASTE<br>LINES        | N  |
|                    |               | 10                     | OTHER OUTSIDE CLOSURES               | N  |
|                    |               | 11                     | WEST SPRAY FIELD                     | N  |
|                    |               | 12                     | 400/800 AREAS                        | N  |
|                    |               | 13                     | 100 AREA                             | N  |
|                    |               | 14                     | RADIOACTIVE SITES<br>INSIDE BUILDING | N  |
|                    |               | 15                     | CLOSURES                             | N  |
|                    |               | 16                     | PART OF CENTRAL OU                   | N  |
|                    |               | 17                     | OU2-PERIPHERAL OU                    | N  |
|                    |               | 18                     | OU1-CENTRAL OU                       | N  |

**FYR Issue OU:** 01

| <u>Issue Category</u>  | <u>Issue</u>  | <u>Affects Protect</u> |               | <u>Recommendation</u>   | <u>Parties</u> |              | <u>Original</u> | <u>Current</u> | <u>Actual</u>     | <u>Status</u>   | <u>Verified by</u> |
|------------------------|---|------------------------|---------------|---|----------------|--------------|-----------------|----------------|-------------------|---|--------------------|
|                        |   | <u>Current</u>         | <u>Future</u> |   | <u>Implmnt</u> | <u>Ovrst</u> | <u>Planned</u>  | <u>Planned</u> | <u>Completion</u> |   | <u>Completion</u>  |
| Institutional Controls | Institutional controls -  | N                      | N             | Institutional Controls - Other  | F              | B            | 12/31/2012      | 12/31/2012     | 12/18/2012        | Complete  | 2/12/2013          |
|                        | Other Issue   |                        |               | Recommendation  |                |              |                 |                |                   |   |                    |
|                        | Institutional controls might not be easily enforceable against a utility easement holder who is not a party to the Environmental Covenant granted by DOE to CDPHE. While this is not a near-term issue (because the Office of Legacy Management (LM) maintains a good working relationship with the current easement holder), the lack of enforceability could become an issue in the future if |                        |               | Replace the Environmental Covenant with a restrictive notice under Colorado law, as provided for in the 2011 Corrective Action Decision/Record of Decision amendment. While an environmental covenant might not be directly enforceable against a prior holder of an interest in land who is not a party to the covenant, a restrictive notice is enforceable by the CDPHE against any person in violation of the institutional controls. |                |              |                 |                |                   | Consultation to replace the Environmental Covenant completed. |                    |

LM and the easement holder (or any successor) do not maintain routine contact.

|            |   |   |   |   |   |   |            |            |          |          |           |   |
|------------|---|---|---|---|---|---|------------|------------|----------|----------|-----------|---|
| Monitoring | Monitoring - Other<br>Surface water POE GS10 mericium concentration began to exceed the RFLMA standard in 2011 and exceeds the standard at the end of this review period.   | N | N | Continue Monitoring<br>Continue to monitor in accordance with RFLMA requirements. Complete work in accordance with the CDPHE- and EPA-approved evaluation plan. | F | B | 12/18/2012 | 12/18/2012 | 2/4/2013 | Complete | 2/12/2013 | The RFLMA consultative process is effective in determining whether, and to what extent, any mitigating action may be recommended, and to establish the schedule to complete actions. Consultation complete. Location place on routine monitoring.   |
| Monitoring | Monitoring - Other<br>Surface water Point of Evaluation (POE) GS10 uranium concentration has periodically exceeded the Rocky Flats Legacy Management Agreement (RFLMA) standard during this review period and exceeds the standard at the end of this review period. POEs are located upstream of surface water Points of Compliance (POCs) at the edge of the former Industrial Area within the Central OU to provide early indication of potential contaminant migration. | N | N | Continue Monitoring   | F | B | 12/18/2012 | 12/18/2012 | 2/4/2013 | Complete | 9/14/2012 | The RFLMA consultative process is effective in determining whether, and to what extent, any mitigating action may be recommended, and to establish the schedule to complete actions. Consultation completed. Concentrations decreased. This sampling location placed on routine monitoring. |
| Monitoring | Monitoring - Other<br>Surface water POE SW027 plutonium concentration exceeded the RFLMA standard in 2010 during a high precipitation event. Flow at SW027 is precipitation dependent. After mitigating actions to improve erosion controls in the drainage were completed in 2010, only very small volumes of infrequent, short-term, intermittent   | N | N | Continue Monitoring<br>Continue to monitor in accordance with RFLMA requirements.   | F | B | 12/18/2012 | 12/18/2012 | 2/4/2013 | Complete | 2/12/2013 | Consultation completed. Additional mitigation completed. This location placed on routine monitoring.  |

flows occurred at SW027.  
 No samples have been  
 able to  
 be obtained for over a  
 year. Because the RFLMA  
 standard is based on 12  
 month  
 rolling average of the  
 results, and there are no  
 sample results for  
 averaging, the  
 standard was no longer  
 exceeded at the end of  
 this review period.  
 Samples will  
 be obtained when there is  
 sufficient flow to evaluate  
 the effectiveness of the  
 mitigating measures.

**FYR Issue OU:** 02

| <u>Issue Category</u> | <u>Issue</u> | <u>Affects Protect</u> |               |                       | <u>Parties</u> |              | <u>Original</u>   | <u>Current</u>    | <u>Actual</u>     | <u>Status</u> | <u>Verified by</u> |
|-----------------------|--------------|------------------------|---------------|-----------------------|----------------|--------------|-------------------|-------------------|-------------------|---------------|--------------------|
|                       |              | <u>Current</u>         | <u>Future</u> | <u>Recommendation</u> | <u>Implmnt</u> | <u>Ovrst</u> | <u>Planned</u>    | <u>Planned</u>    |                   |               |                    |
|                       |              |                        |               |                       |                |              | <u>Completion</u> | <u>Completion</u> | <u>Completion</u> |               | RPM                |
|                       |              |                        |               |                       |                |              |                   |                   |                   |               | MISSING            |

**FYR Issue OU:** 03

| <u>Issue Category</u> | <u>Issue</u> | <u>Affects Protect</u> |               |                       | <u>Parties</u> |              | <u>Original</u>   | <u>Current</u>    | <u>Actual</u>     | <u>Status</u> | <u>Verified by</u> |
|-----------------------|--------------|------------------------|---------------|-----------------------|----------------|--------------|-------------------|-------------------|-------------------|---------------|--------------------|
|                       |              | <u>Current</u>         | <u>Future</u> | <u>Recommendation</u> | <u>Implmnt</u> | <u>Ovrst</u> | <u>Planned</u>    | <u>Planned</u>    |                   |               |                    |
|                       |              |                        |               |                       |                |              | <u>Completion</u> | <u>Completion</u> | <u>Completion</u> |               | RPM                |
|                       |              |                        |               |                       |                |              |                   |                   |                   |               | MISSING            |

| <u>OU</u> | <u>SITOWIDE</u> | <u>PROTECTIVENESS DETERMINATION / STATEMENT</u>   |
|-----------|-----------------|---|
| 00        | Y               | Protective<br>Because the conditions at all OUs are protective, the site is protective of human health and the environment.   |
| 01        |                 | Protective<br>The remedy for the Central OU is protective of human health and the environment because surface water concentrations are meeting standards at points of compliance, and monitoring and maintenance plans and institutional controls are working to prevent unacceptable exposure to site contaminants.                    |
| 02        |                 | Protective<br>There are no issues or recommendations for the Peripheral OU and OU3, Offsite Areas. Conditions in these OU's allow for unlimited use and unrestricted exposure. EPA published a Notice of Partial Deletion from the NPL for the Peripheral OU and OU3 on May 25, 2007. A five-year review is not required for these OU's |
| 03        |                 | Protective<br>There are no issues or recommendations for the Peripheral OU and OU3, Offsite Areas. Conditions in these OU's allow for unlimited use and unrestricted exposure. EPA published a Notice of Partial Deletion from the NPL for the Peripheral OU and OU3 on May 25, 2007. A five-year review is not required for these OU's |



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 8

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JUL 30 2012

Ref: 8 EPR-F

Scott Surovchak  
Rocky Flats Site Manager  
US Department of Energy,  
Office of Legacy Management  
11025 Dover Street Suite 1000  
Westminster, Colorado 80021

Re: Five Year Review Report for Rocky Flats US  
DOE Site, Jefferson County, Colorado

Dear Mr. Surovchak:

Thank you for submitting the Five Year Review Report for the Rocky Flats US DOE Site, Jefferson County, Colorado. The US Environmental Protection Agency (EPA) in consultation with the State of Colorado concurs with your assessment that the remedy for the Central Operable Unit is protective of human health and the environment. We agree with your determination in the sitewide protectiveness statement that the remedy is protective of human health and the environment. This information will be included in the EPA's annual Superfund Five-Year Review Report to Congress.

No issues or recommendations relating to this Five Year Review will be tracked in the EPA's Superfund tracking system, CERCLIS. Although the report lists some issues and recommendations, none of these affect protectiveness, and therefore will not be tracked. The environmental indicator for this site is "current human exposure is controlled and a protective remedy is in place." Environmental indicators include site wide human exposure control and contaminated groundwater migration.

The due date for the next five year review report will be August 03, 2017.

Sincerely,

A handwritten signature in black ink, which appears to read "Martin Hestmark".

Martin Hestmark  
Acting Assistant Regional Administrator  
Office of Ecosystems Protection  
and Remediation

cc. Carl Spreng, CDPHE

## **Table of Contents**

### **Executive Summary**

#### **1.0 Introduction**

*Includes purpose, period covered by review, authority, lead agency, site map, FYR Summary Form.*

#### **2.0 Background**

*Includes a brief site summary (site description, land use, history of contamination, cleanup, basis for taking action, tables of contaminants), site chronology (references a timeline in appendix), regulatory framework (RFLMA). Refers to other documents (e.g., last FYR) for details.*

#### **3.0 Remedial Actions**

##### **3.1 Remedial Action Objectives**

*Defines RAOs and presents RAO summary table.*

##### **3.2 Remedy Selection**

*Describes selected remedy (institutional and physical controls, including monitoring and continued operation of landfills and GW treatment systems), Table of ICs, environmental covenant*

##### **3.3 Remedy Implementation**

*Status of remedy, map of compliance locations and remedy features (landfills, treatment systems), reference table of Contact Records in appendix, system operations/O&M (requirements, operational summary, costs)*

#### **4.0 Progress Since the Last Five-Year Review**

*Protectiveness statement from last FYR, Table of last FYR recommendations and status, Table of RFLMA evaluation of remedy components.*

#### **5.0 Five-Year Review Process**

*Describes FYR team, documents reviewed (reference list of documents reviewed in appendix)*

##### **5.1 Community Notification and Involvement**

*Includes discussion of June notification, RFSC presentation, RFSC involvement*

5.2 Data Review

5.2.1 Groundwater Monitoring

*Summary of GW monitoring results, reportable conditions, graphs of contaminant concentrations, map of AOC locations, 5-year trends, GW model conclusions (as appropriate)*

5.2.2 Surface Water Monitoring

*Summary of SW monitoring results, reportable conditions, graphs of contaminant concentrations, map of POC locations, 5-year trends*

5.2.3 Landfill Inspection and Maintenance

*Summary of inspections and maintenance over last 5 years, reportable conditions*

5.3 Site Inspection

*Summarize March 2017 site inspection, include inspection form in appendix.*

**6.0 Technical Assessment**

6.1 Question A: Is the remedy functioning as intended by the decision documents?

6.1.1 Remedial Action Performance

*GW and SW monitoring summary, optimization of GW treatment systems*

6.1.2 System Operations

*Landfill maintenance summary*

6.1.3 Institutional Controls/Physical Controls

6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?

6.2.1 Changes in Standards

*Summary of ARARs review and detail of changes to surface water quality standards*

6.2.2 Changes in Toxicity Data

*Summary of changes to risk assessment parameters*

6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

**7.0 Issues, Recommendations, and Follow-Up Actions**

**8.0 Protectiveness Statement**

**9.0 Next Review**

**10.0 References**

**Appendices**

Site Chronology

RFLMA Attachment Two tables

List of Contact Records

Documents Reviewed

Site Inspection form (from March 2017 inspection)

Revisions to ARARs summary table (?)

Glossary of terms (?)